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ABSTRACT

The basic principles of operant and classical conditioning are presented, and their applications for the in-service training of teachers are discussed. Certain classroom behaviors are analyzed and applied to the classic stimulus-response paradigm. Activities are generically classified as positive or negative reinforcers and these reinforcers, in turn, are applied to teaching goals such as student achievement, self-confidence, and self-esteem. In this vein, precision teaching and contingency contracting are presented as teaching systems that use behavioral principles. Related print and video materials are listed and discussed. (JB)

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In-service Training of Teachers as Behavior Modifiers:

Review and Analysis

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IN-SERVICE TRAINING OF TEACHERS AS BEHAVIOR MODIFIERS: REVIEW AND ANALYSIS

INTRODUCTION

IN-SERVICE TRAINING. - The design and conduct of training activities for teachers who are working in the classroom has become in recent years a widespread, complex and formidable enterprise. In-service training of teachers is available in many formats and contexts. Among these are: regularly scheduled university courses conducted in the afternoons or evenings to fit the work schedules of classroom teachers; summer institutes of one to ten weeks duration are conducted at various institutions around the country; short-term workshops are held on curriculum or in-service days during the school year; after hour special programs of from one to several days duration are also conducted. Several programs exist which provide extension service instruction to teachers within local school settings. All of these forms of in-service instruction cover a wide variety of subject matter. Regardless of the topic covered in in-service training, the general goal of such training is to

provide teachers with extended or additional capabilities beyond those received in pre-service training which will result in increased effectiveness on their part in the classroom.

The realization of that goal, while worthy, is difficult to attain. Attainment of the goal is even more difficult when interest centers in measuring increased teaching effectiveness in terms of changes in pupil behavior. The most widespread model for the evaluation of teaching effectiveness is the determination of the extent to which the student teacher models or emulates a "good" teacher. An apprenticeship is generally included in the form of student or practice teaching during a teacher's pre-service university career. Success in the apprenticeship phase of teacher training is based largely on ratings made subjectively by supervisors of the student. Supervisors, generally, are university personnel from a school or college of education who are professionally involved in teacher training or who are "master" or "cooperating" teachers in the school where the student undertakes the apprenticeship. McClain (1968) and Chabassol (1968) describe two ways in which such evaluations of teaching effectiveness are made. McClain matched scores on Cattel's Sixteen Personality Factor Questionnaire and success in student teaching determined by ratings of supervisors. Chabassol used a combined array of ratings and

subjective appraisals of "suitability for teaching."

Even with the increased number of innovations introduced in recent years to the field of teacher training, whether at the pre-service or in-service level, little evidence exists to show what effects training of any kind has on the teacher's ability to foster changes in pupils. The use of videotaped feedback and role playing as a process for changing complex social behavior was described by Eachus (1965) and Haines and Eachus (1965) and later independently developed for use in teacher training at Stanford University. The adaptation to teacher training was called micro-teaching, described in Fortune, Cooper, and Allen (1967). The evaluation of teaching effectiveness in the micro-teaching approach still rests in the evaluation of behavior change in terms of the acquisition of skills described by the trainers. These criterion skills are never directly related to desirable or expected behavior changes in pupils in the classroom. Kallenbach and Gall (1969) examined micro-teaching in relationship to other methods of training teachers and found that no differences could be demonstrated immediately after or a year after training through various methods. The only benefit apparent through the use of micro-teaching was a savings of time and administrative problems. Again, in the Kallenbach and Gall data, teacher effectiveness was determined

through rating dimensions of teaching competence and the examination of teacher activities. The question of whether a teacher can do things which result in changes in children is not answered directly by the research evidence derived from studies of teacher training. This applies generally to both pre-service and in-service training programs.

OPERANT TECHNOLOGY. - The emergence of a science of behavior from the laboratory into schools and clinics began in the late fifties and early sixties. The technology for producing changes in behavior stems directly from the work of B. F. Skinner. Before proceeding to a discussion of the current use of operant technology or behavior modification in training teachers, the features of that technology which distinguish it from other approaches to teaching will be described.

The terms radical behaviorist and behavior modifier apply to individuals engaged in basic or applied research activities or in therapeutic or educational settings who subscribe to the approach and methods for analyzing behavior which are commonly connected with B. F. Skinner. In the following discussion I will call such individuals radical behaviorists and will speak of radical behaviorism.

CONTROL OF BEHAVIOR. - The most commonly described feature of radical behaviorism is the concern with the control of behavior. The word control is subject to a broad range of connotations, many of which are perjorative. However, the word assumes a cloak of valuelessness when used within the domain of radical behaviorism by becoming a term in the language of the experimental analysis of behavior. The primary activity involved in describing behavioral control is in searching for events which are related to behavior in some way. Such events are labeled controlling variables. A description of the relationship between behavior and such events is a statement of a functional relationship. The systematic description of such relationships is a functional analysis. A controlling variable is generally called the stimulus. The behavior which stands in relationship to the controlling variable is called the response. Day (1969) points out that

> the practice of looking for functional relationships is obviously similar in certain respects to the effort to find relations between cause and effect. Yet, in attempting to discover functional relationships, the radical behaviorist does not accept any a priori logical assumption of a universe

> that is orderly in a mechanical sense upon which he feels he must base his...work (p. 318).

The concern with control is based largely on the notion that reliable or consistent knowledge is likely to lead to action of a worthwhile sort.

THE SCIENTIST AS BEHAVING ORGANISM. - The radical behaviorist views himself as a behaving organism whose behavior is controlled in the same ways as other behavior. Holding oneself as a behaving organism leads to not trusting one's intellectual and verbal behavior at face value. That is, it is easy (because of the nature of our language) to assume that statements of knowledge in some way deal with the nature of the objects described as if they were permanent. The radical behaviorist tries to eliminate reification as a process within his verbal output.

The analysis of his own behavior occupies much of the time of the radical behaviorist. Endowing a reinforcer with inherent power to link "things" called behavior together is a constant danger in the analysis of behavior. Such insistence on an avoidance of mentalism and reification is maintained by increasingly efficient products of the analyses of behavior.

VERBAL BEHAVIOR CONTROLLED BY DIRECTLY OBSERVABLE EVENTS. - It is important at this point to present the definition of verbal behavior as a subset of those events within the category, behavior. While behavior is "...what an organism does in commerce with its environment...(Skinner; 1938, p. 21)," verbal behavior consists of those behaviors of an individual that "...are mediated by other persons (Skinner; 1957, p. 2)." It is clear that much of the verbal behavior of individuals (including that of radical behaviorists) is under the control of unobservable or indirectly observable events. The radical behaviorist does not categorize behavior controlled by either type of event as more or less valuable or important. The concern of some educators with internal cognitive events as of principal importance in teaching is clearly described by Bruner, Bettlehim, Montesorri, Piaget, and others. Whereas, verbal behavior for which controlling variables can be directly observed are of primary concern to the radical behaviorist, since such variables can more likely be manipulated to productive and useful ends than can verbal behavior for which controlling variables cannot be directly observed.

Direct observation of events and a specification of functional relationships can be followed by interpretive verbal performances. Such extended performances are determined by

the speaker's history as well as the observed events themselves. Observation, as used here, does not refer to a special process open only to the radical behaviorist.

> The radical behaviorist feels as free to observe or otherwise respond to his own reactions to a Beethoven sonata as he is to observe those of someone else (Day; 1969, p. 321).

Verbal behavior is many times viewed as the product of some process internal to the individual. For example, a psychotherapist may identify the behaviors emitted by an individual as characteristic of someone lacking in ego strength. "Ego strength" readily assumes homuncular properties. The therapist sets the occasion for behaviors to occur which can be differentially reinforced on the basis of whether succeeding behaviors represent increased "ego strength." Ultimately, behavior and its controlling variables are the subject matter dealth with by therapists, social workers, teachers, etc. The radical behaviorist takes behavior as it occurs.

THE IMPORTANCE OF ENVIRONMENTAL VARIABLES. The concern with the environment that characterizes the radical behaviorist derives initially from a very practical source. Verbal behavior is controlled by events in the environment to some

extent. The next feature of the environment that leads the radical behaviorist to focus on its properties is that

> any manipulation inevitably consists of some change in the environment of the person whose behavior is to be affected, and one has little reason to expect a manipulation to be successful, unless it reflects some functional relation between behavior and the relevant environmental change (Day; 1969, p. 322).

Verbal behavior and the events which control it provide us with meaning systems and the possibility of dealing with others. Effective verbal behavior is controlled by the verbal community which forms our environment. By treating the environment as the source of controlling variables, the radical behaviorist avoids inadequate explanations of behavioral phenomenon. In the example given earlier, the use of an inner process such as ego strength to account for verbal behavior is simply incomplete. Accounting for verbal behavior without identification of its observable antecedent serves no function (other than perhaps as an intellectual exercise).

When an explanation of behavior involves a private event, the radical behaviorist looks more closely for a possible

relation between that event and some environmental event. When such a relation can be demonstrated, then the reference to a private event becomes unnecessary. When private events are observable to only a single individual, then the offered explanation "is of interest only as a sample of very complexly constructed verbal behavior (Day; 1969, p. 323)." This is not to say that the radical behaviorist assumes environmental explanations to be the only form of meaningful explanation possible. He chooses to utilize the form of explanation which offers the most ready access to behavioral phenomena.

These then are the basic differentiating features of radical behaviorism from other approaches to the study of human behavior. Radical behaviorism, or behavior modification, as the approach is called when applied to a clinical or educational setting, offers

> a set of concepts and principals derived from an experimental analysis of behavior, a definite procedure for the application of these concepts and principles to education, a research method which concentrates on the individual child and the philosophy of science which encourages a

search for observable causes (Bijou, 1971, p. 4).

Operant technology, behavior modification, or radical behaviorism represents an empirically based internally consistent approach to the study of human behavior. Because of the particular philosophical and scientific tenets that underlie the position, little if any effort has been made to relate the body of knowledge generated through operant technology to other approaches for dealing with human behavior.

Recently, Krantz (1971) has described a phenomenon of mutual isolation between radical behaviorists and others in the discipline of psychology. It is important to consider the basis from which operant technology has developed into an approach to changing educational practices. The virtually self-imposed isolation of radical behaviorists from others within psychology is virtually complete and is increasing year to year, as determined from citation data in professional journals (Krantz, 1971, p. 62). The tactics of scientific research that are employed by radical behaviorists are not essentially compatible with those of other behaviorists and non-behaviorist researchers in psychology, and certainly in education. In order to describe how, and to what extent, principles of behavior and techniques of behavior modification

are being incorporated within in-service training activities, those principles require elaboration. This elaboration is made in order to provide a more comprehensive view of exactly what teachers are being trained to do and how the effects of such training are being measured.

PRINCIPLES OF BEHAVIOR

The principles of behavior management, which will be included in this section, are those commonly included in in-service training programs for teachers. The set of principles is not exhaustive of those used in operant technology generally. In other sections of this paper, the programs, workshops, and materials used for teaching these principles in operation will be described.

POSITIVE REINFORCEMENT. - Operant technology concerns itself with the consequences of behavior. The function of these consequences is to change the frequency of occurrence with which given behaviors occur. A behavior which results in the occurrence of an event which is then followed by an increase in the frequency of the behavior is said to have been positively reinforced. The important feature of the principle of positive

reinforcement is that it is a dynamic empirical function. An event cannot be labeled a reinforcer, and positive reinforcement cannot be said to occur until a determination is made of the effect of an event on the behavior in question.

PUNISHMENT. - The category of consequences described above are those which result in the increased frequency of the behaviors which they follow. Punishment is said to occur when the frequency of a given operant decreases as a result of the contingent occurrence of an event. The process is called punishment, and the consequent event is labeled a punisher. Punishment then is functionally opposite to reinforcement in the sense that the presentation of an event results in one case in a reduction in the occurrence of the preceding behavior, and in the other case the presentation results in an increase in the occurrence of the behavior. Some events obviously act as punishers, such as electric shock, extreme heat, extremely loud noises, etc. In addition to the reduction in frequency effected by punishment, other effects on the organism can be seen. In the case of positive reinforcement the increase in behavior which results is the most important and directly observed effect of the process of reinforcement. The "side effect" of punishment is that the occurrence of punishing

events can act as eliciting stimuli for reflexive behavior. For example, general physiological arousal results from the occurrence of shock, loud noise, and extreme heat, in addition to pain and the concomitant disruptive behaviors which accompany pain.

> A critical point to be gleaned from the present discussion of punishment is the complexity of its results. The effects of punishment depend on too many factors for us to write a simple paradigm of Procedure, Process, and Results. The Processes and Results of the punishment Procedures are variable and conditioned upon the type of behavior being punished as well as upon the states of many variables operating both in the past and present environment of the punished individual. Until the general laws of punishment are worked out, the emotional by-products accompanying aversive stimulation would suggest that its use in the practical control of human behavior be undertaken with extreme caution (Millenson 1967, p. 430).

CONDITIONED REINFORCEMENT. - So far two general types of environmental events have been described when used as consequences for behavior. The determination of whether an event acts as a punisher or as a reinforcer when its occurrence is contingent on behavior is an empirical, functional process. There are many imaginable events whose occurrence would have no effect on behavior. These events are functionally neutral stimuli. However, if such a neutral event is paired with (presented at the same time) another event which does have the effect of reinforcing or punishing a behavior, the neutral event will assume punishing or reinforcing properties. When such an event assumes properties of a controlling variable, it is called a conditioned reinforcer or a conditioned punisher. Events which act on behavior without such pairing are called unconditioned reinforcers or unconditioned punishers. The effects of conditioned reinforcers and punishers on behavior are temporary. That is, the unconditioned reinforcer or punisher must be presented occasionally in order to maintain the effect of the conditioned event on behavior.

Conditioned reinforcers are produced then because of a designed or naturally occuring temporal relationship between them and some other event which has existing reinforcing or punishing properties. Another way in which an event can be

established as a conditioned reinforcer is through a means-end relationship in a sequence of behaviors. Many behaviors which occur in the repertoires of individuals occur as chains of discrete behavioral elements. Chains of behaviors always terminate in the occurrence of some unconditioned reinforcer. The consequences of each element in such a chain act as necessary conditions for the occurrence of the terminal consequence in the chain. The two processes are closely related but represent distinct functional relationships between behavior and environmental events.

EXTINCTION. - A behavior which occurs with some given frequency can be reduced to a zero or near zero frequency of occurrence by withholding the contingent consequent event. The termination of reinforcement and its effect on behavior is called extinction. The term extinction is generally applied only to the process of terminating positive reinforcement. However, the term extinction can be applied appropriately to the termination of punishment and its effect on behavior. The application of the principle of extinction to punished behaviors is a complex process and generally it is not dealt with to any extent in the training of teachers.

SHAPING. - The preceding principles are largely concerned with increasing or decreasing the occurrence of behaviors which already exist in the

repertoire of individuals. Since teaching concerns itself with the building or formation of complex behaviors which previously were not within the repertoire of the individual, much attention is paid to the principle of shaping through successive approximations. Shaping, particularly when applied to human behavior, deals with topographical changes in behavior more than quantitative changes in behavior. Shaping as a procedure begins when specification of some terminal performance not previously observed in the repertoire of the individual is made. Contingent reinforcement is then applied to a component of the final form which does in fact exist within the repertoire of the individual. As the contingent reinforcement strengthens that component behavior, a new criterion for the occurrence of reinforcement is established which calls for a slight change in the form of the behavior previously strengthened. As this new component is strengthened, the criterion for the occurrence of reinforcement is again raised and a new behavior is then strengthened. This procedure is followed until the final form previously specified is reached. Shaping, then, is a sequential set of response differentiations brought under the control of a positive reinforcer. Teaching can then be described as a continuing process of shaping operant behavior. This principle is one of the most important features of operant technology. Operant behavior is generally considered as emitted behavior, because so much behavior is emitted and changed in frequency due to the effects of the consequent events.

ACTIVITIES AS REINFORCERS. - In the first two principles outlined in this section, consequences of behavior were characterized as events in the environment. That universe of events includes other responses or behaviors of the individual as well as those of others. David Premack (1959) provides an account of positive reinforcement of behavior by other behaviors of the same individual. His statement of what has come to be known as the Premack Principle is as follows:

> "Reinforcement results when an R (response) of a lower independent rate coincides, within temporal limits, with the stimuli governing the occurrence of an R of a higher independent rate (Premack; 1959, p. 219).

This principle is of major concern in the analysis of teaching. Consider that if children are placed in a specified environment called a school and frequency with which the children engage in certain activities are counted, it will be seen quite readily that some activities occur much more frequently than others. Quite possibly children eight or nine years of age when placed in or around the school will do such things as play in a sandbox, swing, climb on a jungle gym, look at an aquarium of tropical fish more often than they will sit at a desk, read a book, write answers to written arithmetic problems, and so forth. What the Premack Principle says is that those activities which occur independently with high frequency can be used as

consequences for behaviors which occur with lower frequencies. Activities can be made to act as conditioned reinforcers through the same two processes described above. This principle then is of importance in training teachers. It provides a set of procedures which can be used with great effectiveness in educational settings due to the wide range of activities which occur and are expected in such settings.

TIME OUT. - Time out is defined as time during which the organism characteristically does not engage in behavior being studied. Time outs are used as probes, markers, and a series of events; it is a method of eliminating the effects of earlier behavior. In the classroom teachers can use a time out procedure as a punishing consequence for disruptive behavior without themselves directly serving as a discriminative stimulus for the occasion of punishment. Teachers may utilize time out procedure by isolating a disruptive child for a fixed period of time during which the disruptive behavior is expected not to occur. The time out can be used in conjunction with the application of positive reinforcement for expected and desirable behaviors while, at the same time, not directly applying a strong aversive stimulus to the individual.

Time out differs from extinction due to the fact that when extinction is applied, the only change that occurs in the environment of a child is the absence or discontinuance of a given reinforcing stimulus. Whereas in time out, the child is removed from the environment where the occurrence of reinforcing events is possible. Given that most environments in which children operate include numbers of both positive stimuli and punishers, the likelihood that the termination of any one reinforcing stimulus will result in rapid deceleration of the rate of a certain behavior is small. The time out procedure offers the teacher a more efficient means for eliminating unwanted behavior from the repertoire of a child.

FADING. - Because teaching is a complex task, the procedures used by laboratory investigators can be unsatisfactory without modification. The behaviors of children which are of major concern to teachers are discriminated operants. That is, particular responses are expected to occur at certain times in the presence of particular stimulus conditions. Shaping of behavior through differential reinforcement of successive approximations is one procedure available to teachers. Shaping procedures are very effective when there is time available to monitor behavior closely to insure that inappropriate partial

responses are not inadvertently reinforced, thereby interfering with and delaying the acquisition of new behaviors.

A second procedure for establishing ne.. discriminated verbal operants in the classroom which efficiently accomplishes what shaping does is the use of prompts and their fading.

> A prompt is a previously taught task signal that the teacher can use to get a specified response to occur in the presence of a new task signal. It is a signal that will eventually be faded out (Becker, Engelmann, and Thomas; 1971, p. 321).

There are several categories of prompts each of which are used in specified teaching tasks. All prompts function as discriminative stimuli for which there is a strong response. This cue or signal is used in conjunction with another discriminative stimulus for which the same response is weak.

The prompt is presented with the "natural" cue and is then gradually withdrawn as the new response is maintained. The gradual withdrawal of the supporting cues for successful behavior is called fading. "Any way in which a stimulus can be made less discriminable in a given teaching context can constitute fading (Becker, Engelmann, and Thomas; 1971, p. 328).

Fading is an integral part of teaching procedures which are designed to result in successful student performance without extensive external support. The withdrawal of cues, the increase of intermittance of reinforcement, decrease of reinforcement magnitude, shifting from material to social consequences all are forms of fading in the sense that the student relies less and less on teacher arranged stimuli for maintaining effective behavior and more on naturally occurring events in the environment. In other words, effective fading involves turning control of a student's behavior over to the available consequences inherent in the performance of tasks.

SELF-MANAGEMENT. - The introduction of operant technology to teachers is offtimes met with greater or lesser aversive responses due to the controlling or manipulative aspects of the approach to behavior change represented by the technology. Moral, ethical, and philosophical concerns are involved in any approach to the education of children. These issues and concerns arise particularly with respect to behavioral technology. The last procedures or principles to be described in this short set deal directly with the capacity of the individual human being to exert control or influence his own behavior.

Yet to a considerable extent an individual does appear to shape his own destiny. He is often able to do something about the variables affecting him.

...Any comprehensive account of human behavior must, of course, embrase the facts referred to in statements of this sort. But we can achieve this without abandoning our program. When a man controls himself, chooses a course of action, thinks out the solution to a problem, or strives toward an increase in self-knowledge, he is behaving. He controls himself precisely as he would control the behavior of anyone else - through the manipulation of variables of which behavior is a function. His behavior in doing so is a proper object of analysis, and eventually it must be accounted for with variables lying outside the individual himself (Skinner; 1953, pp. 228-229).

In describing a set of procedures which can be directly applied to the classroom setting, it is important to consider the long term objectives of instruction. It can be said that there is always a goal or terminal objective for the instructional process that has as its primary concern the generation of self-managed, self-controlled behavior on the part of the individual students.

Skinner has characterized teaching as the arrangement of contingencies of reinforcement (Skinner; 1968). The establishment of any contingency of reinforcement in an educational setting has merit or efficiency to the extent that it approximates the society for which the individual is being educated. Contingencies can also be arranged (teaching can occur) which increase the frequency of occurrence of the identification of controlling variables and the responses of which they are a function, as well as arranging circumstances to increase the responses themselves. This second level of abstraction in dealing with teaching is at the heart of the problem of self-management or self-control. By arranging contingencies which make it likely that an individual will more closely examine the variables affecting his behavior which can be seen directly and of those variables which are available for observation by the individual himself and to no one else,

self-control can be directly taught.

Skinner (1968) suggests a procedure for carefully reducing the effect of applied reinforcers to established behaviors so that other controlling variables can be managed by the individual. This process has been called "stretching the ratio." The technique of "stretching the ratio" suggests gradually reducing the frequency of occurrence of some reinforcing stimulus. "Stretching the ratio" does not involve a disappearance of the effects of controlling variables. What is suggested is that those contingencies arranged by a teacher are to some extent artificial and can be dropped ultimately in favor of contingencies which occur naturally in the environment.

> A man may spend a great deal of time designing his own life - he may choose the circumstances in which he is to live with great care, and he may manipulate his daily environment on an extensive scale. Such activity appears to exemplify a high order of self-determination. But it is also behavior, and we account for it in terms of other variables in the environment and a history of the individual. It is these variables which provide the ultimate control.

This view is, of course, in conflict with traditional treatments of the subject, which are especially likely to cite self-control as an important example of the operation of personal responsibility. But an analysis which appeals to external variables makes the assumption of an inner originating and determining agent unnecessary. The scientific advantages of such an analysis are many, but the practical advantages may well be even more important. The traditional conception of what is happening when an individual controls himself has never been successful as an educational device. It is of little help to tell a man to use his 'will power' or his 'self control.' Such an exhortation may make self control slightly more probable by establishing additional aversive consequences of failure to control, but it does not help anyone to understand the actual processes. An alternative analysis of the behavior of control should make it possible to teach relevant

> techniques as easily as any other technical repertoire. It should also include the procedures through which society maintains self-controlling behavior in strength. As a science of behavior reveals more clearly the variables of which behavior is a function, these possibilities should be greatly increased (Skinner; 1953, pp. 240-241).

TEACHER BEHAVIORS MEASURED BY CHANGES IN CHILDREN

All of the instances in which operant procedures have been applied to educaticnal settings whether concerned with teacher training or with changes in children, have a single identifiable characteristic. That characteristic is that the effectiveness or efficiency with which an individual teaches a student is always measured in terms of the changes produced in the student.

THE CRITERION. - Generally, the excellence of an individual teacher determined by administrators, certified by state departments of education and by school committees involves a statement of the academic preparation of the individual together with a cursory statement of the history of employment of the individual teacher.

These two dimensions (academic degrees and years of experience) form the basis of describing the qualifications of an individual to teach. Many times forms which require personal and professional recommendations for a teacher as a candidate for a teaching position call for estimates of the quality of the individual's poise, articulation, appearance, ability to maintain discipline and perhaps the arrangement of curricular materials and lesson plans.

The criteria base which would be used to determine teacher effectiveness by a radical behaviorist would center in determining such things as whether a teacher can establish virtually error-free performance on the part of students; whether the tasks set for students by the teacher are presented in an orderly sequential fashion leading to some identifiable end point; and perhaps, finally, whether the teacher keeps accurate and consistent records of student's performance so that contingencies can be rearranged when control over given behavior is not achieved. The difference in the criterion of efficiency for a teacher rests in the ultimate objective of education as a societal institution: the preparation of young members of that society to function effectively within the culture. All of the procedures utilized to train teachers in behavioral technology focus on the determination of behavioral changes in children. Teachers are thus trained to be managers of reinforcing contingencies rather than entertainers or orators.

TEACHERS AS STUDENTS - STUDENTS AS TEACHERS. - A cartoon appeared in the Harvard Crimson once which showed two laboratory rats talking to each other inside a skinner box. The caption for the cartoon read, "Boy have I got this guy trained! Everytime I press the bar, he gives me a pellet of food." Besides the humorous aspect of the cartoon, a very important issue is addressed. This is the fact that anytime we deal with the change of one individual's behavior due to the arrangement of contingencies by another individual, both parties undergo behavior change in time. When a teacher attempts to instruct a student, the attempt is reinforced by the desired change in the student. If the desired change is not forthcoming, the attempt was inappropriate for certain reasons. The controlling variable of interest is the rate of change in the student's performance. Teacher behavior or "instructional attempts" are reinforced by that controlling variable. The circumstances under which a teacher emits praise or approval for the student behavior are those which also act to reinforce whatever teacher behavior immediately preceded them. The lack of such a reciprocal occurrance of reinforcement between teacher and student and a suggested remedy have been discussed in a diffrent context than the classroom.

An interesting and provocative approach to the graduate education of psychologists was presented by Ulrich and Kent (1966) which is applicable to the present concern of in-service training of teachers. Psychology, like education, has for many years engaged in advanced training of new members of their respective professions which is based largely on a process of attrition. That is, individuals who aspire to advanced or additional training in a given area are typically selected on the basis of test performance and grades in previous academic endeavors. In the case of graduate education in psychology, and certainly in education, the procedure for completion has many features in common with "rights of passage." The establishment of a series of hurdles over which the individual candidate will jump or falter is in effect much like an inquisition. The agonizing hours the individual student in advanced programs spends preparing for exams, reading a wide variety of complex materials, and generally agonizing over what is next to come, are all representative of behaviors under the control of aversive or painful events in the environment. (In the following "teacher" can be substituted for "scientist" and "teaching" for "research.")

> In psychology it is often stated that our basic goal is to train students to become

scientists. But what is it that we would have them learn? What does a scientist really do? As in most areas of education, we have attempted to teach other people to be a psychologist before ever really deciding what it is a psychologist should be. Good programming practice, however, dictates that we delineate our goals and specify exactly the behavior we desire. In short, we would be asking what it is that competent psychologists do and then attempt to delineate the specific behaviors which would provide a bona fide educational target for the proper training. Admittedly, this is a difficult problem, but nevertheless, it is one which must receive more attention. An alternative which appears to offer some promise is to use selected behaviors of selected scientists as models to be followed in establishing certain behavioral goals. For example, we might tentatively agree that there will be some very specific technical behaviors necessary

> for the proper conduct of research,...in more general terms, the model scientist must be concerned in varying degrees with theory, method, research results, and the effective application of psychological principles to a variety of areas (Ulrich and Kent; 1966, p. 2).

Once the desired behaviors are more exactly specified, the second step of an effective training program should be to discover and arrange the variables of which those desired behaviors were a function. This, of course, implies an assumption that the behaviors of students are also natural phenomena, and as such, enter into lawful functional relationships with specifiable variables. ...With this in mind, we should approach the problem of education from the point of view that the teacher, as the behavioral engineer, is primarily responsible for what the students learn. We know, of

> course, that each individual comes to the educational setting with a behavioral repertoire that has a direct bearing on the difficulty of our engineering task. Nevertheless, a more challenging approach is to assume that we can succeed in our training efforts and that failures are due to methods and not to learners. An analysis of these failures should specify not only the variables responsible for them, but also the conditions necessary for remedy (Ulrich and Kent; 1966, p. 4, emphasis added).

If the in-service training of teachers is to show widespread measurable improvement in the lives of children as of students, then an approach to such training, which responds to the initial suggestions of Ulrich and Kent will be necessary. The emphasized sentence in the previous citation points up one of the more interesting aspects involved in the application of behavioral technology to the teaching process. Many contingencies exist in public education which increase the likelihood that an indivfidual teacher will look to a student's failure in a specific academic area as a cue for applying a

student's failure in a specific academic area as a cue for applying a diagnostic label to that student and referring the case to a counseling center or special remedial teachers. Circumstances are such in schools that the available alternatives focus attention on the learner when failure occurs in instruction, and not on the methods used. Very seldom in in-service training programs are children used as an integral part of the training procedures for teachers. However, children represent a primary source of corrective data for the activities of teachers. In a very real sense, then, children should function as "teachers" for teaching personnel undergoing additional training. After all, it is the children who are ultimately the target of any training endeavor.

If children can serve as sources of information, teachers can serve as learners in the same sense. Teachers arrange contingencies of reinforcement and apply consequences to student's behaviors in the classroom. Behavior modification approaches to teaching permit the teacher to identify the direction and end points of learning sequences and the efficiency of the procedures used to foster such learning.

It is this role of teachers that is of primary concern when considering the design and effects of in-service training programs. It is desirable that any training approach to in-service teachers

in the area of behavior modification model the procedures being advocated. Also, it is desirable that the special conditions that exist for training at the in-service level be used effectively as in integral component in the training. That is, a program of teacher training should draw on the environment within which the teacher functions on a day-to-day basis as a primary source for the programmed application of procedural steps.

Now that the basic dimensions of behavior modification and their application to educational concerns have been described, the materials and programs available for use in in-service training can be presented.

MATERIALS FOR TEACHER TRAINING

The materials that are available for use on an in-service basis with teachers concerned with the analysis of behavior fall into two categories--print and film. Of the print materials that are available, the range is broad covering basic textbooks on the one hand and short programmed pamphlets on the others. The films that are available on behavior principles in educational settings are few in number but quite consistent in quality and organization. Certain films also have supplemental printed material to accompany them.

PRINT. - (1) The initial work to be discussed was designed as a text-book for the experimental analysis of behavior, Behavior Principles by

Ferster and Perrott (1968). The book is organized unlike usual textbooks for the most part. Content by parts and chapters is arranged sequentially in order of difficulty, and each succeeding part presupposes mastery of earlier portions of the text. The book is designed to be used in a course or a program of instruction which involves oral interviews between the instructor or proctor and the student. Interviews are to be conducted at the end of each part of each chapter and successful completion is required prior to moving to the next part. The terminal objective for the text is verbal mastery of operant technology. Each of the seventeen chapters is divided into three to five parts, each of four to fifteen pages in length. The basis for the interview is a probe inserted at the end of each part which takes the form of a list of questions or desired behaviors that the learner should have acquired.

The second author of the text was responsible for very little of the textual material in the book itself. However, she bore the major responsibility for testing the content and its organization on students from a wide variety of disciplines and age levels. The text has been used successfully with high school students, psychiatric nurses, physicians, undergraduates, and graduate students in psychology among others. In each case following student testing, portions of the textual

material were revised and edited. Only operant principles are treated by this text with the exception of brief presentations of classical conditioning principles.

The material presented begins usually in each part with a description of the principle under consideration and the basic laboratory findings which substantiate it. The text then moves toward the application of the principle in a wide variety of clinical and educational settings. It is primarily this aspect of the organization of the text which lends itself well to in-service teacher training. This is due to the fact that many of the descriptions of applications are concerned with classroom and learning behaviors. As with many other texts available for use, teachers offtimes find the examples from the animal laboratory to be unsatisfactory. Teachers have been found (Brent; 1971) to be resistant at times to presentation of data from the animal laboratory. Animal data are left in favor of data from studies of humans, both children and adults, in mid-text.

Another possible source of difficulty in the use of this particular text for in-service training is that the organization of the text can be expected to be unfamiliar to teachers and others.

> Students too may grow restive under the text's single-minded view of things: they may adjust poorly to its unfamiliar format, which is designed not for casual scanning or random memorization, but for systematic study (Carrier; 1969, p. 660).

The Ferster and Perrott text has much to recommend it, however. The organization of the book and the sequential presentation of information together with a built-in behavior sampling procedure all serve to model good behavioral management strategies. The text is long (542 pages) and difficult. The likelihood of a teacher utilizing the principles described in the text, however, is quite high if that teacher as a student follows the stated procedures for completing the text.

(2) The second book available for in-service training programs is The Technology of Teaching, by B. F. Skinner (1968). This book, unlike Ferster and Perrott, was not designed specifically as an instructional program. It does contain, however, treatments of important moral, ethical, and philosophical issues. The book is a compilation of several previously published papers by Skinner, and some original pieces are included here for the first time. Skinner's masterful use of the English language is readily apparent in this volume. Because

of this, many teachers as students will find the book eminently readable. This is particularly true with respect to the subjects Skinner chooses to deal with in this volume. Space is devoted here to teaching, thinking, creativity, discipline, self-management, and others of particular concern to the classroom teacher.

> If one is concerned that students learn to undertake their own learning and their own thinking, these kinds of behavior can be analyzed and deliberately taught. One finds much in these pages about 'self-management behaviors,' the kind that are involved in selective attention, in studying, in learning to learn, in remembering, in solving problems, and in generating new ideas. The necessity for various kinds of covert behavior in such activities is acknowledged. But such behavior, although covert, is best taught at the overt level, following an analysis of the techniques required to arrive at the expected outcome.

The chapters which deal with student

> motivation and with such matters as discipline and self-control are perhaps closest in tone and thought to vintage Skinnerian theory. ...Many suggestions and examples are given, which would seem of immediate practical value to teachers who decide to make use of them. In fact, as many modern studies attest, it would appear to be in this area of behavior management where the contingency of reinforcement theory has its most striking and undeniable usefulness for educational practice (Gagne; 1970, p. 487).

This collection of papers by Skinner can serve as a useful introduction for teachers to a broad variety of topics in teaching to which operant principles have been applied. The book, taken together with other instructional activities as part of an in-service training program, can be particularly effective, due to its clear and understandable description of the application of behavior principles to the classroom.

(3) A short but effective program has been prepared by Peterson and Gullion (1968). This book, titled Living with Children, is prepared as a linear program. It is relatively

short (117 pages) and tightly organized as a basic introduction to dealing with children in the home and in the classroom. The book is in two sections, the first of which deals with human learning and includes program segments on reinforcers, how they can be used, the difference between social and non-social reinforcers, superstitious behavior, how to observe behavior, how to retrain already learned behaviors. The second section concentrates on changing or eliminating undesirable behavior and deals with general cases of frequent fighting, negativism, highly active noisy children, dependency, fright, and withdrawal.

The book can be used by itself or as an introductory step in a longer program of training. Generally, the program takes from one and a half to four hours for an individual to complete. It can serve as the basic introduction to operant principles in the applied setting. But some form of presentation of more sophisticated and complex procedures would generally follow mastery of the techniques described in the book.

(4) Recently there has appeared a major undertaking in a development of an instructional text for teachers in the nature and use of behavior modification. This is the work of Becker, Engelmann, and Thomas (1971) entitled Teaching:

A Course in Applied Psychology. The text is programmed, but in a different manner than the one discussed previously. This text, as is the case with others, has been prepared utilizing data from student tests in the preparation of units and their sequencing. The authors describe the course to be developed from the text in the following way:

> The course is organized into two main parts. Part I focuses on the use of behavioral consequences to reduce classroom problems of management or motivation and to strengthen desired classroom behavior. Part I is a behavior modification primer for the teacher. Some teachers view behavior modifications simply as tricks to get children to behave and make the teacher's life less troublesome. This is far from the case. Behavior modification is simply effective education. It is the systematic use of learning principles to accomplish our goals for children. From the beginning of this venture, we wish to emphasize that the primary goal of teaching is the induction of knowledge and skills that

> will enable a person to achieve a fuller life in our society. Even though this text at times focuses on the elimination of problem behavior, keep in mind that teaching is still the primary goal.
>
> Part II shifts to an analysis of the structuring of teaching sequences to teach the general case - to teach concepts and operations that will be useable outside the classroom. Gradually a general model of teaching is built up to provide a basis for indicating the key elements in any teaching act. Implications of this model of teaching for programming curriculum, building intelligent behavior, and in dealing with the problems of special education are examined. The net result is a specialized but comprehensive coverage of teaching - when teaching is viewed as making learning happen (Becker, Engelmann, and Thomas; 1971, p. v).

Each unit in the text, of which there are thirty-four,

begins with a statement of objectives for that particular unit. The statement of objectives varies with respect to their degree of precision. Objectives range from such things as "When you complete this unit you should be able to define teaching as a three-step process," to the much more general and vague "The objective is to develop skills and self-observation, so that events that influence behavior can be readily seen as examples of reinforcing and punishing events." Each unit then continues with the presentation of a lesson. The lessons also vary in their degree of complexity and the extent to which they rest on the introduction and conceptual definition of technical terms or the presentation of case-like material. In the second part of the text the focus of the material is on how a teacher can set the occasion for the learning of concepts and operations. In this second part a different kind of instructional unit is introduced. The authors call these units <u>think</u> units, whereas other units are called <u>learn-to-do</u> units.

> Think units are designed to explain a viewpoint or the implications of the viewpoint, rather than to impart new teaching skills. They are designed to teach the reader new ways of evaluating possible courses of

> action in teaching, curriculum selection, and programming (Becker, Engelmann, and Thomas; 1971, p. 235).

The arrangement of all units concludes with one or more exercises and a set of answers. The student is asked to complete each exercise with an accuracy rate of 90 per cent or higher before proceeding to the next unit. The last part of each unit is a set of discussion questions for use with other students and an instructor in small groups.

Of particular interest in the Becker, Engelmann, and Thomas work is that the authors show no hesitation whatsoever in dealing directly with topics in teaching which have not been subject to widespread discussion in the field of behavior modification previously. The issue of self-concept or self-esteem is one such issue.

> It can readily be observed that the child who has self-confidence is more likely to stay with the problem and show interest in new learning situations, but such a child is not a good learner because of first being taught self-esteem and confidence. He has been reinforced for learning many tasks and has also learned,

as a result of this reinforcement, that he is a capable and likable person.

Any effective teaching program can include procedures for simultaneously teaching children a variety of attitudes about learning, about school, and about themselves as learners. Without an effective teaching program, the task is more difficult, if not impossible. Those who emphasize self-esteem as a primary goal in child development probably have the cart before the horse. Dealing with self-esteem as the goal misses the point that self-esteem is the product of good teaching. One cannot teach attitudes about learning without presenting instances of learning tasks. One cannot teach self-esteem without presenting instances of accomplishment (Becker, Engelmann, and Thomas; 1971, p. 192).

Another interesting feature of the text is the fact that it together with the instructor's manual, provide a variety of formats for the organization of an in-service training course

on behavior modification for teachers. (it is taken for granted that the material could be effectively used at the pre-service level as well). Because the authors faithfully adhere to the principles that they advocate, it is of interest to examine their statement to the instructor who would use their text:

> This course is designed to operate without lectures. Films might be added at various times, and demonstrations can be provided. Occasional lectures in special areas might be helpful. The instructor's manual that accompanies this text makes it possible for the instructor to use a variety of procedures (Becker, Engelmann, and Thomas; 1971, p. vi).

The rigid adherence of most instructors to a lecture format, however labeled, will be difficult for psychology unless that instructor is attuned to the technology represented by the text itself. The authors strongly advocate the use of discussions, questions to prompt small group verbal exchanges among students as an effective adjunct to the text itself.

Becker, Engelmann, and Thomas have clearly identified their terminal behavioral objectives, ordered them in sequential fashion, identified a variety of effective reinforcers, and

have managed to put them all together between two covers. It is to be expected that this work will be used widely and well to help teachers foster effective learning on the part of children.

(5) Another short programmed text which has been prepared specifically for use by teachers is that of Buckley and Walker (1970) called Modifying Classroom Behavior: A Manual of Procedures for Classroom Teachers. The program is divided into two parts, the first concerned with basic principles and the second with application. Sections within the first part deal with how behaviors are learned, why they are continued, how they can be eliminated, and how they are measured. Each section contains four sets of instructional frames with the exception that the third on the subject of elimination of behaviors contains six sets. The second part contains one section on the modification of classroom behavior and consists of five sets of instructional frames. The program is well designed and has obviously been revised as a result of field test data. Its format and appearance as a spiral bound pamphlet make it a convenient-to-use program. It could be expected that teachers could complete the program in their spare time in a matter of a few days. It can stand by itself or be used in conjunction with other presentations and exercises. The text also contains

a set of references which are integrated within the exhibits and introductions to instructional sets, so that an individual teacher who desires additional information on a given topic can find it readily.

As with the other programs and texts designed specifically for use by teachers, Buckley and Walker nowhere mention laboratory research with sub-human organisms. Rather they concentrate for their examples on basic principles of behavior in the classroom. Cases and exhibits are presented which illustrate the various aspects of behavior modification techniques under discussion. One concern, the use of this text as with other short programs is in the strength of the consequent events applied by the program itself. Certainly for many individual teachers, the consequence of accurate responses to instructional frames will be sufficient to maintain the behavior of completing the program. However, as anyone who has written or used a program will readily attest, being right doesn't make it so. However, the capable instructor or planner of in-service training programs can easily attach classroom projects and directed activities to the program in order to enhance the acquisition of the concepts and procedures contained in the program itself.

(6) The first investigator to obtain data in an applied setting on the Premack principle was Homme in 1963 (Homme; 1966). He has recently prepared an instructional program for teachers on the use of activities as reinforcers in the classroom. This book is called How to use Contingency Contracting in the Classroom (Homme, Csanyi, Gonzales, and Rechs; 1970). The program is presented in two parts; the first deals with the nature of contingency contracting, and the second deals with applications to behavior in the classroom. The program objectives are described in the introductory pages of the text, but provide little explicit information on the expected terminal behaviors:

> This book explains an extremely effective method of motivating elementary and high school students. The method, contingency contracting, is based on the systematic application of some generally accepted principles of human behavior. . . .
>
> [An]. . .underlying principle is that children can learn more willingly and satisfactorily if the framework within which learning takes place has been mutually agreed upon between teacher and student.
>
> A teacher who uses contingency contracting makes an agreement or contract with his students under

> which he promises rewards in return for the desired learning behavior by the students. The method can be used at any grade level and with any subject. (Homme, et al; 1970, p. ix)

The program is directly intended to teach effective learning management techniques which are suitable for use across subjects and ages. Many principles of behavior are not presented directly or at all in this text. The focus is on reinforcement by activities and the establishment of explicit contingencies.

The two parts of the text are programmed in different fashions. In part one, each chapter contains three parts: (1) self-diagnostic pre-test over the section; (2) narrative summary section and intermediate diagnostic test; (3) instructional frames and post-test. Instructions to the reader say that if the pre-test is passed with 100% accuracy, then the post-test is to be completed. If it too is passed with 100% accuracy, the reader is to begin the next chapter. If the reader has difficulty, then the second section of the chapter is to be completed using the summary, intermediate test, and the instructional frames.

The second part of the text is programmed in the manner of Pressey's adjunct autoinstruction. Short presentations of information are presented and are then followed by a short set

of questions in the form of the earlier instructional frames. Missed questions are the cue for reading the preceding narrative again. Each chapter in the second part concludes with a post-test.

There are criterion tests for each of the parts. These tests are self-diagnostic since references for each question direct the reader to the appropriate remediation in the text.

An attractive feature of contingency contracting is that no changes in curriculum or scheduling are necessary when it is used as a management process for classroom learning. Contingency contracting basically involves an explicit statement of the task behaviors to be performed by the student and the reinforcer to be presented by the teacher. Homme speaks of amounts of tasks and reinforcers since the procedure involves time durations for both events. The two components require that the teacher be willing to change classroom practices, not subject matter and and materials. The changes involve the teacher in re-ordering presentations, specifying discrete units of material related to one task, and in teaching individuals instead of groups. As is true with any procedure for applying principles of behavior in the classroom, teachers ofttimes object that large groups of students cannot be treated using the method.

> The teacher may be asking how she can get 30 students to do the same thing at the same time and reinforce them all with the same activity. One of the main. . .[concerns] . . .is to point out that this is not only an almost impossible task--it is unnecessary. There are three reasons for considering it almost impossible:(a) not all students need the same amount of work in the same subject area; (b). . .not all students find the same events reinforcing; (c) most important, not all students finish the assigned task at the same time. . . .[In the case of 30 students]. . .the reinforcement could not be made contingent only upon the completion of the task. . .This means that what would actually be reinforced would probably be sitting quietly and waiting. This is not a bad task, but it is not the task which was intended to be reinforced. (Homme, et al; 1970, pp 33-34)

By providing individual instruction using the procedures of contingency contracting, the teacher can more directly meet the instructional goals for a group of students than by dealing with the group as a whole.

The system of contingency contracting includes "progress checks" as a major component. Progress checks test a student's completion of a task or unit of tasks. Such performance checks

provide both the student and teacher with important evidence on the effects of a given contracting sequence.

Another major issue in instruction addressed by the Homme text is that of self-management. Three types of contingency contracting are: manager-controlled, transitional, and student-controlled. The program describes a five-step process for generating self-management.

The first step is the establishment of the terms of a contingency contract by the teacher. The first transitional phase consists of two steps. In one, a contract is determined by the teacher completly specifying the task and jointly specifying the amount of reinforcement with the student. In the other step the joint process centers on the task while the teacher retains full control in determining the amount of reinforcement. The second phase of transition has three forms: (1) joint setting of task and reinforcement by student and teacher; (2) student determination of amount of reinforcement, teacher determination of amount of task; (3) student determines amount of task, teacher determines amount of reinforcement. The third transitional step has two forms: (1) student determines amount of reinforcement and shares determination of amount of task with the teacher; (2) student determines amount of task and shares determination of amount of reinforcement. The last step is that the student

controls his own contracting. That is, the teacher can establish a contract where the task is that the student sets and completes several small contracts. By gradually enlarging the terms of such a contract for contracting the teacher facilitates self-management.

Homme notes that setting instructional tasks or objectives is a difficult job for many teachers to accomplish. He suggests the use of Preparing Instructional Objectives (Mager; 1963) to help teachers acquire that capability. Sections in the program are devoted to preparing materials, diagnosing individual performance, recording progress, and organizing a class. The program concludes with a chapter on correcting problems or malfunctions in contracts.

The program should provide immediately and directly applicable procedures for teachers to use. The information presented is all based on techniques developed and tested in a wide variety of settings by Homme and his colleagues.

(7) The system of applying behavior principles to teaching developed by Ogden Lindsley is called Precision Teaching. A recent book presents a training sequence in this system: Precision Teaching: An Initial Training Sequence (Kunzelmann, ed; 1970). Like contingency contracting, precision teaching is concerned with improving teaching within existing school configurations using available curriculums and materials and teaching methods.

The procedures involved in precision teaching concentrate on observation and recording of critical aspects of student behavior in order to assess individual student capabilities and to establish self-paced individual instruction.

Lindsley characterizes the differences between behavior modification and precision teaching as resting in behavior change procedures.

> Precision teaching. . .uses the measurement procedures that operant conditioning originally used but relies more on traditional change procedures that teachers and students invent and select. We're finding in precision teaching that the most effective ways of improving behavior, when we measure behavior frequency, tend to be curricular. They consume less classroom time and don't rely on synthetic rewards or some form of punishment to change behavior. In other words, in precision teaching we try to get the child doing more successful classroom work by making curricular changes which involve him in the learning process, rather than trying to jack up a dull curriculum with rewards for doing boring tasks.

Precision teaching involves daily recording of the frequencies of different classroom performances on a

> standard chart. This permits teachers and students to project the outcome of the procedures they are using. Standard charts facilitate sharing data.
>
> Behavior modification tends to use procedures like reward and punishment in new and more controlled ways to affect instruction. The child's performance is usually measured by the teacher and does not necessarily include frequencies or the use of a standard chart. In behavior modification, measurement tends to be used to determine whether the reward system was effective or should be altered. (Lindsley; 1971, p 115)

Precision teaching records improvement in performance. It's procedures are designed to tell a teacher precisely what the effects of teaching are for each student in each area each day. The information available to a precision teacher allows her to determine what changes in teaching are to be made to improve performance and to determine when a particular change is ineffective. The pattern followed in precision teaching is to pinpoint behavior, record observations, change the task events, and try again. "Precision teaching tools are designed to improve and refine current teaching methods and materials. . . .Precision teaching simply adds a more precise measurement instrument to present teaching. . .(Lindsley; 1971, p 119)."

Kunzelmann presents the methods of precision teaching in a combination of textual material, programmed instruction, and exercises. The volume is arranged in five chapters, each prepared by a contributing author. The chapters provide a description of the elements of precision teaching,the nature of the type of measurement involved, the planning of changes in teaching based on the data obtained, recording of measurements of improvement, and the application of measurement in specific cases as illustrations of the procedures. Training exercises and materials are included in an appendix.

There are two major features of the precision teaching system. These are the use of the Standard Daily Behavior Chart and the method of identifying (pinpointing) behaviors to be improved. The measurement of behavior is always observed rate of occurrence. The term used for a single occurrence of a given behavior is movement cycle. This term defines a behavior which can occur repeatedly, can vary in frequency, and involves movement by an individual. Examples of basic "movement cycles" used in the diagnosis of capabilities within the system are: write numbers, say words, say letters, write letters, etc. Each category has a defined stimulus configuration and can be recorded as number correct and number of errors per unit time.

The use of the Standard Daily Behavior Chart to record behavior is at the heart of the system. This standard form is a six-cycle log chart with calendar days plotted on the abcissa. The ordinate is designed to permit records of behavior rates occurring during the waking day of an individual. The log scale ranges from 0.001 to 1000. The scale is based of the assumption that people are awake approximately 16 hours or 1000 minutes each day. A behavior which occurs only once each day would have a rate of 0.001 per minute. A behavior which occurs at a very high rate, such as saying phonemes by an adult could occur 1000 times in one minute. The chart thus provides sufficient range to cover the extremes of rates for humans. The log scale permits comparative recording of rates. The relationship or difference between errors and correct answers can be plotted daily to provide a teacher with a very sensitive measure of change in a particular student's behavior.

If a student is asked to solve 30 single place addition problems each day, the time taken for completion, the number correct, and the number of errors would then be used to derive two cycle rates. These rates would be charted daily. If the circumstances under which the child performed were producing improvement, then the rate for correct answers would increase and the error rate would decrease. If they remained stable

or worsened the teacher would plan a change and record the effects, if any, on the rate.

The text provides an exceedingly thorough presentation of the precision teaching system. Like the Ferster and Perrott text, it requires careful study. Its use in short term inservice training programs would require competent direction to insure mastery. The benefits to be derived from such effort on the part of teachers are great:

> Precision teaching is not an approach; it is an easy, inexpensive system of monitoring daily improvement--not performance, but improvement. Improvement is acceleration; performance is frequency of occurrence. . . .In short then, precision teaching entails recording the acceleration or change in frequency of wanted behaviors or the deceleration of unwanted behaviors, as opposed to simply recording level of performance. (Lindsley; 1971, p 119)

FILM. - Films are used frequently as components of in-service training programs. The several films available which illustrate basic principles of behavior and their application to clinical and educational settings are all of high quality and are designed to be used as instructional materials. Because the films available mostly deal with handicapped or deprived children, teachers sometime object that the procedures are

not applicable to their particular setting. This objection is readily overcome by stressing the generablizable nature of the procedures. However, films are needed to deal with "normal" classroom situations. It is expected that such films will be available in the very near future.

(1) A basic introduction to behavior principles is provided by an outstanding series of four films written and directed by Ellen P. Reese which is titled, Behavior Theory in Practice. This set of films is available from Appleton-Century-Crofts (Reese; 1968).

Part I presents respondent and operant behavior. The film introduces behavior theory as a set of general principles of behavior which are applicable across many species of organisms. Respondent behavior is illustrated using salivation in a dog, and the food seeking reflex in a newly-hatched robin. Operant behavior is introduced using a raccoon, wooley monkey, dog, mouse and a pigeon to illustrate basic terms and procedures. Operant conditioning is shown using a pigeon pecking a key to present the elements of a basic conditioning procedure.

Part II introduces shaping and schedules of reinforcement. Various operant performances are demonstrated and terms are presented. Shaping in rats, dogs, children,

and pigeons is seen. The operants range from simple to highly complex and occur in a laboratory and in natural settings. Also included in this segment is the topic of programmed instruction. A program on electricity is presented which shows a teenage boy progressing at his own rate through normally difficult academic material. The segment concludes with B. F. Skinner demonstrating and describing a handwriting program of his own design.

Part III presents more complex principles of behavior--generalization, discrimination, and motivation. A pigeon generalizes a response to a variety of stimuli. Differentiation of the conditions under which reinforcement and extinction occur is shown again using the pigeon. The use of differentiated responding to measure sensory capacity is demonstrated with the use of human visual acuity. "Reading" is established in a pigeon. Other discriminated operants are shown in the behavior of a dog, a horse, and in people. The topic of motivation is treated as a set of operations to establish various states of deprivation and then selecting an appropriate reinforcer. Conditioned reinforcement, punishment, escape, avoidance and intracranial self-stimulation are also presented in this segment.

The last film in the set describes and illustrates sequences of behavior. Chains of behavior of various types are presented to show the relationship between related operants which lead to a terminal reinforcer. These illustrations are provided in the behavior of pigeons and the behavior of a child. The final portion of the segment deals with complex sequences of behavior which begin as chains and for which discriminative stimuli are faded to produce long, smooth, complex performances. The film ends with an illustration of the complex reciprocal operant relationship between a man and a seeing eye dog in the natural environment.

These four films taken together provide a thorough and comprehensive basic presentation of principles of behavior. Each segment of the film is accompanied by appropriate graphic displays of relationships between the technical terms used in the experimental analysis of behavior. Each film stands alone and can also be used in sequence. Films can be stopped at the end of each sequence in order to facilitate groups in discussion of the material presented on a single principle or procedure.

(2) The most useful film available for use in in-service teacher training programs is Born to Succeed: Behavioral

Procedures for Education. This film, like the first described, was authored by Ellen P. Reese (1971) and is available from Appleton-Century-Crofts. The film is in two parts.

Part I, Teaching Number Concepts to Retarded Children, documents the process of designing specific behavior modification programs to treat a particular learning problem. Each step in the preparation of instructional procedures is illustrated using an actural classroom teacher and her students in a public school class for trainable retarded children. The program developed in the film is that of teaching number concept to a young Downes syndrome girl. The instructional goal of number concept is broken into nine tasks, the performance for each of which is clearly observable and measurable. The use of shaping to achieve instructional objectives is illustrated with materials prepared specifically in each of the nine task areas for the particular children involved. The manner in which records are kept on changes in performance is also presented. The conclusions drawn from this first part of the film are that it is possible to teach "ineducable" retarded children to discriminate the abstract property of number. The fading program which was developed is shown to generate

transfer across tasks. The occurrence of the newly acquired behaviors in the course of regular classroom activities is seen. Some attention is also given to the generation of self-management.

The second part of the film is especially remarkable. In this segment of film a severely retarded girl and her teacher learn from each other. All of the aspects of a complete behavior modification program are included in this piece of film. Arithmetic is taught in an adjunct program to regular classroom instruction. The "crash" program was conducted in short sessions which totaled five and one-half hours. The tasks included in the program include the abstraction of more and less, order, equality, and addition. A token economy is established using a small reinforcement menu. Baseline data are recorded, motivation is established, and a favorable instructional situation is designed. Fading of extrinsic reinforcers is demonstrated in the film and the beginnings of self-management of arithmetic on the part of the child conclude the film.

The impact of this film is great. Watching the changes that occur in both the young woman serving as the teacher and those of the child is emotionally effective and thoroughly convincing with respect to the procedures. Here in a

relatively short film, the reciprocal nature of the instructional process is clearly shown.

A film outline and study guide is in preparation to accompany Born to Succeed. It is presently under revision and will provide an invaluable instructional aid to designers of in-service training programs.

(3) Another film demonstrating basic procedures involved in learning, discrimination, and superstition has been prepared by Mrs. Reese and B. F. Skinner called, A Demonstration of Behavioral Processes by B. F. Skinner. This film is also available through Appleton-Century-Crofts. The film is brief (26 minutes) and includes, in addition to the demonstration of basic operant procedures, a question and answer period with Dr. Skinner.

(4) The film which presents the most complex and longest application of behavior principles to instructional processes is, Behavior Modification: Teaching Language to Psychotic Children. This film documents the remarkable work of O. Ivar Lovaas with psychotic children at the U. C. L. A. Neuropsychiatric Hospital. Like the other films, this is also available from Appleton-Century-Crofts.

This film is overwhelming in its intensity. The children for whom Dr. Lovaas and his colleagues designed the treatment

program are, at the beginning of the film, virtual hopeless cases. The children variously engage in extreme self-destructive behaviors, bizarre displays of self-stimulating behavior, and display a lack of play or social receptiveness. Although the children make noises such as screams, shouts, and cries, they are mute--they do not speak. The film progresses through a twelve-month period of behavior modification for several of these children. At the end of the film, the children are caring for themselves, giving and receiving affection and love, talking and reading, playing. They are becoming functional human beings. The powerful message included in this film cannot be understated.

The techniques that are presented in the film include the full range of principles described earlier, including the use of punishment to suppress psychotic behaviors. The issue of the use of punishment in treatment programs for disturbed children has caused much dialogue and concern among behavior therapists and behavior modifiers as well as within the general educational community. One of the early sequences in the film illustrates the kind of extremely destructive behavior which offttimes occurs in psychotic children. In order to describe the relative effectiveness

of extinction and punishment to eliminate such maladaptive behavior, a record is presented of one boy's delivery of several thousand blows to his dead during extinction. Shown as a use of punishment is the same boy immediately following the administration of electrical shock as a consequence for a single self-administered blow. The data provided by the film show that the rate of self-destructive behavior drops immediately to zero and remains there over a long period. The boy's name is John and the film provides a sequence in which he, after having electrodes removed from his arms following the single shock, immediately runs to hug the young man and woman who have been working with him. After this remarkable display of affection, he goes to a table in the room, sits down, and begins feeding himself.

The illustration of John is a particularly dramatic moment in the film which is filled with other dramatic moments. It is not only the dramatic moments which make this film what it is. The documentation of the painstaking planning and preparation that is involved in a major undertaking of this sort is clearly presented throughout. The manner in which objectives are chosen on a short and a long term basis are presented. The choice process in the administration of behavioral consequences on the basis of changes

in childrens' behavior occurs repeatedly. The transfer of the control of behavior from primary reinforcers such as food to other tangible consequences and then to approval, praise, and affection is included throughout each sequence in the film.

Terms are illustrated within the film. Observation and data recording procedures are shown graphically and operationally. Mistakes in programming or in teaching are included in the film together with their resolution.

In one sequence, a girl named Pamela is undergoing treatment to eliminate echolalic verbal behavior. Such behavior is difficult to change and the fact that Pamela engages in outbursts of psychotic behavior further complicates matters. The teacher makes several mistakes in administering the training program. Psychotic behaviors are accidentally reinforced. Instructional steps are begun before the previously occurring behavior is completely controlled. However, the teacher observes the effects of the mistakes and changes her procedures in response to Pamela's behavior.

The film concludes with Ricky reading a story and answering general questions from the text. His voice and eyes can be described as alert, bright, and interested.

His facial expressions respond to approving comments. It is an altogether suitable way to conclude this unique film. The film should be seen by any teacher who cares to modify her own teaching. It is one of the clearest illustrations available of the highly complex reinforcing properties of effective teaching.

(5) The last film to be described is Rewards and Reinforcements in Learning prepared by Meyerson, Kerr, and Lazar (1968). The film is distributed through Behavior Modification Productions, Inc. The use of behavior modification procedures in four individual cases and in two group settings is shown.

Four basic steps are emphasized throughout the film: Defining terminal behavior; Planning successive approximations; Identifying a reinforcer; and Providing immediate and frequent reinforcement for successful behavior.

The illustrations given in the film are of a token reinforcement program for tying a shoelace by a young retarded girl, teaching a physically handicapped boy to walk unaided, and the elimination of a sillibant s in another young boy. In addition to these three presentations of individual programs, a film record is presented of a lackluster classroom and a

program designed to increase success and participation by students. Also included is an experimental remedial program run after school hours in an inner city setting. The powerful effects of a token economy when used appropriately are clearly seen in this segment of the film.

A study guide has been prepared to accompany the film which provides a detailed examination of the procedures used in the cases shown in the film. It is organized in a step-by-step format so that it is directly applicable to in-service training program requirements.

PROGRAMS FOR TEACHER TRAINING

Before proceeding to the presentation to a sample of programs in existence for teacher training, a discussion of when a teacher requires such training and what the criteria of training effectiveness can be is in order. Certainly from an administrative point of view there are some teachers who can profit from in-service training programs and there are teachers who are quite effective in their classrooms. Lindsley (1971) suggests that the efficient teacher creates a learning environment in which educational improvement is consistently present. This educational improvement includes dimensions

of human functioning which are not represented in scores from standardized academic achievement tests. Change scores on such tests determined in September and again in June provide very little information on what and how a particular teacher fosters learning. If it can be determined that a particular would profit from some program of in-service training, then an administrative decision could be reached to supply that training. If it can be determined, on the other hand, that a teacher is effective, then no additional training would be indicated. What is being suggested here is that in-service training should be applied on the basis of diagnosed teaching deficiency and not applied in a wholesale, blanket fashion.

The second concern involved in the use of in-service training for teachers is the assessment of the effects of such training. If some sort of preliminary determination of a need for training based on the teacher's effects on children, then changes in those effects should be forthcoming following any in-service training regardless of its focus. It would further be helpful if measures of the effects of training were used which corresponded to the procedures utilized in determining the need for training.

The application of the experimental analysis of behavior to the classroom provides a variety of such measures. The body of literature which has emerged in recent years in the area of behavior modification is for the most part, experimental and empirical. The investigators represented by the literature are largely trained as researchers. The criteria which are used by researchers may not be entirely suitable for evaluation from an administrative point of view in schools. However, there does seem to be close correspondance between the requirements for a good research study and the information needed to determine the effectiveness of classroom procedures.

> The hypothetical typical teacher's behavior seems in a very general way to approximate most of the criteria of an applied behavior analysis. It appears that a closer congruity between these criteria and the teacher's behavior in the classroom could result in improved teaching methods and provide important feedback to the teacher on the efficacy of her teaching procedures. . . .If the teacher is able to better approximate the criteria of an

> applied behavior analysis, she is then in a much better position to apply behavioral techniques effectively to a greater variety of classroom problems, and she will be able to evaluate the techniques that are used. (Hanley; 1970, pp 621-622)

GENERAL TRAINING PROGRAMS. - (1) Ogden Lindsley (1970) has established a training program based on his precision teaching system. Not every teacher needing additional training can afford the time or expense of long-term programs. However, there supervisory personnel in most school systems who have, as one of their responsibilities, training classroom teachers or providing other forms of assistance. Lindsley has developed a program which is designed for such supervisory personnel so that they can return to their positions following training and themselves construct training programs specially suited for the individuals and physical setting in their schools. The program represents a system which can result in widespread improvement in the effectiveness of in-service training.

Four annual short courses have been conducted by Lindsley's organization, Behavior Research Company in Kansas City, Kansas. These short courses are specifically designed for individuals who are regularly involved in training or

supervising ten or more teachers. Each participant in the trainer's short course receives a complete kit of materials needed to train ten teachers. The program is four days long and covers a wide variety of topics. Since the program is designed not only to train trainers of teachers, but counselors, therapists, and others, the precision teaching system is enlarged to become "precise behavior management."

The program provides instruction in the use of audio-visual equipment and materials in order to conduct training. The basic steps in precision teaching of pinpointing, charting, arranging, and programming are introduced early along with techniques for describing behavior change in terms of rate and acceleration. Participants are taught how to use and then teach others to use the Standard Daily Behavior Chart to record speed, accuracy, improvement, and estimates of the outcome of current management procedures. Participants are also taught how to develop personalized lesson plans and to compare the effects of three or more curriculums for an individual student. Methods of summarizing data on behavior changes are also included.

Because this program is designed for trainers, additional topics are included to increase the effectiveness of the supervisor-participants. Methods are developed for monitoring

large programs of teaching by systematically obtaining daily behavior rates and bi-weekly charting of improvement. Procedures are also described for estimating accurately future needs for applications of the methodology in an economical and productive manner.

One of the most unique features of the program designed by Lindsley is what he has labeled the "Behavior Bank." Since short courses for trainers are conducted repeatedly, a system has been devised for storing data on the application of behavior management principles for use by program participants and those they in turn train. A rather unusual method is employed for enlarging the behavior bank; although it is consistent with the application of behavior principles. A participant in the program pays a fee to be trained and to receive materials needed to do additional training. When a participant has trained ten others in the use of the precision teaching system and they have completed ten projects or applications of the procedures, the projects and data are sent to the behavior bank. The original participant receives a portion of his fee as a refund. For example, if an elementary school supervising teacher were to participate in Lindsley's program and then return to the school, the

training would be applied. When ten teachers had been trained in the system and they in turn applied it to at least ten of their students, the lesson plans and data would be sent to the behavior bank. The supervisor would then be sent the refund. Of course, all participants who contribute to the behavior bank get an additional dividend. They each have access to all of the information contained in the bank. Thus, a self-perpetuating system for the application of behavior principles in in-service training has been generated.

(2) Another general program which includes those elements of behavior modification omitted from the precision teaching system is that offered by the Columbus State Institute on an annual basis. The range of topics covered by the general program in the Columbus State format is quite wide.

Behavior modification is applied to institutions, the community, psychotic children and adults, mentally retarded children and adults. Instruction is provided on self-help, language, and educational and vocational skills. Other topics presented in this program include the use of parents as teachers and therapists, educational technology, systems analysis, program administration, use of the technology in private practice, marriage counseling, and the treatment of alcoholism.

The program simultaneously trains beginning, intermediate, and advanced participants. The organization of the workshop includes small group topical discussions of presentations, movies, slide and videotaped accompanied lectures, and most importantly practical applications. These practical applications provide tutoring from the instructors in the workshop in the design and conduct of actual short-term programs of behavior modification during the workshop. This dimension is certain to facilitate direct application following the training experience. Additional information regarding this form of general training program is included in Bassinger (1971).

(3) Another type of general training program format is the holding of short-term workshops directly in schools which is typified by McIntyre (1970). Such short-term workshops operate in the working environment of the teacher and provide training in behavior modification which can applied immediately to the teacher's classroom environment. The emphasis of programs of in-service represented by McIntyre is on the utilization of instructional materials, the specification of objectives, and the use of contingency contracting.

The workshops conducted by McIntyre are designed for teachers in special education, but could be easily adapted

as a format for training teachers in other areas as well. What is represented by this type of workshop is a service to schools by a regional center.

(4) Another form of in-service training program is represented in summer institutes conducted on specific topics for restricted audiences of teachers. One such type of program is the institute on programmed instruction for teachers of the deaf conducted by the Southwest Regional Media Center for the Deaf (SWRMCD; 1970).

> This institute is six weeks in duration and has--
> The goal of. . .[providing]. . .the participants with short-term intensive training in writing programmed instructional materials to make. . . [the participants]. . .more sophisticated consumers of programmed instructional materials. (SWRMCD; 1970, p 2)

In addition to instructional objectives for attaining mastery in the area of programmed instruction, each participant produces a program of instruction on a task suited to the individual needs students.

The approach to in-service training represented by topical summer institutes is one in which specific training objectives can be achieved during the program.

However, there is little evidence to indicate that the particular institute described or any others are responsible for any major long-term changes in the behavior of the teachers who attend them. What is suggested is that this form of in-service training be accompanied by short-term in-service workshops periodically during the academic year following the institute.

(5) Because of the large number of requests for in-service in the area of behavior modification attempts are being made to develop automated instructional packages which do not require special personnel or large expenditure of funds in order to accomplish the training. One such attempt to develop automated instructional packages was tried recently (McIntyre, Lilly, Levine, and Eachus; 1971).

Three instructional modules were prepared for use by teachers. The first was designed to teach the preparation of instructional objectives. The second was designed to teach how to establish performance criteria in the classroom. The third module was designed to teach the identification of appropriate data sources related to given instructional objectives and performance criteria.

Each module is used by a small group of teachers. The group is instructed to solve given problems as a group. Tasks

are included in each module which are programmed to assure successful completion. Feedback on the accuracy of group responses is also designed as a group process so that each module is programmed and self-diagnostic. Each module can be completed in one hour. The three modules may be used sequentially in one three hour session or in three one hour sessions. Modules are comprized of an audio tape cassette, automatic carbon task sheets, and an item of instructional material commonly found in the classroom.

SPECIFIC TRAINING PROGRAM DEVELOPMENT--A CASE STUDY. - The matter of designing a program to meet particular needs of a single teacher or a state-wide system requires careful planning is required. This concluding section will present a case study in the design of a workshop for a state-wide program of deaf education.

The overall aims of the program involve a change process for deaf education on a state-wide basis. The primary focus of the program, which utilizes the workshop as an initial major event in the program, is the need for new and innovative approaches to language development in deaf children. The literature available on academic achievement by deaf children in the area of receptive and expressive language indicates clearly

that practices and approaches used in the past have failed to meet the needs of children. Such evidence applies on a nation-wide basis. The need for change is not directed to a single state program or approach to teaching methods. What is suggested is that all approaches, strategies, methodologies, and techniques require careful examination to determine their effects on the growth and education of individual deaf children.

Much concern has been expressed in recent years that teaching practices and school activities, whether in residential or day program settings, move actively toward individually prescribed learning activities and away from group-paced, lock-step modes of instruction. Several alternative strategies exist for individualizing instruction in the classroom. The recent evidence of developing instructional technology indicates that the systematic application of media to the instructional process can lead to substantial benefits for teachers and children in a wide variety of curriculum areas.

At a planning meeting of the designer of the workshop and the program administrators, the range of issues and concerns that could possibly form the basis for an initial workshop was discussed at length. Many issues emerged from this meeting which focused on the problem of maximizing the effect of a program for change on the education of deaf children in the state.

It was determined at the planning meeting that any attempt to deal with language development locally from the pre-school to the graduate level in one two-week summer workshop would not be overly ambitious, but would limit the extent to which any given problem could be explored. It was also decided that by selecting some beginning and basic areas of concern to comprize the substantive content of the initial summer workshop that an orderly sequence of development for the program as a whole and its relationship to other activities occurring within the state could be planned efficiently.

Rather than select the whole of language development as the substance for the workshop, a decision was made to restrict the subject matter to early reading readiness as a topic. This decision was made so that the capabilities and objectives for the program could be optimized within a finite area of educational concern. Thus, an orderly plan of involvement by the program in a change process for deaf education within the state could be achieved.

Some time was consumed in the planning meeting achieving consensus on the combination of behavior modification and curriculum development during the workshop. It should be noted that the decisions made during the planning activities for the workshop and in the design of the two week session involved a

reasonably high level of risk. This risk centered in giving the appearance to program participants of arbitrarily choosing a single approach to teaching over other alternatives. It also involved restricting areas of application to a limited audience of children out of the total age range when developing a reading curriculum.

It was felt that traditional approaches to curriculum development would not have a high likelihood of producing significant change in the language of deaf children. The risk of initially meeting resistance, objections, and hostility from those participating in the workshop was weighed against the expected outcomes of a new and useful approach to progress in education. The risks are well worth running. A change in any establishment or enterprize can be an upsetting and disruptive process, and this is particularly true in education. The planners of the workshop did not anticipate wholesale acceptance of the approaches being suggested by the objectives and goals of the program. But, at the very least the decisions made in planning would precipitate a careful examination of the existing procedures and concepts involved in teaching for effective language growth in deaf children. At maximum the planned program would result in a change in curricular alternatives and instructional procedures.

Since the workshop was to deal with two primary themes, the objectives for the workshop covered a limited range of process and content. These are the goals and objectives for the workshop:

1. To provide participants with information on change in special education.
2. To provide participants with information on the need for individualized instruction in language development for deaf children.
3. To present a sequenced set of instructional activities which through participation in them would;
   a. Produce verbal fluency in the participants with basic principles of behavior modification
   b. Result in participants describing procedures for individualizing instruction in the classroom
   c. Provide participants with instructional alternatives for individualized instruction
   d. Result in participants observing and recording student behaviors in instructional settings
   e. Develop in participants the production and application of behavioral objectives and performance criteria.
4. To provide participants with information on the dimensions and sequences of child development.

5. To provide participants with information on reading as a set of sequential, ordered skills.
6. To have participants write instructional objectives for reading readiness in the task areas of;
   a. Association
   b. Discrimination
   c. Matching
   d. Sequencing
   e. Completion

The informational goals of the workshop were met largely through the utilization of guest speakers. Four guest speakers were used. These speakers were chosen on the basis of their professional capabilities in given areas of concern.

The first speaker in the program was a prominant national figure in the field of instructional technology and a major advocate of change in educational practices on a nation-wide basis. This speaker's participation in the workshop centered in describing the effects of current educational practices and the limitations of the instructional system as it exists. He advocated a series of applications of technology and the focus on children as the primary sources of information about the effects of instructional activities.

The second speaker was a recognized expert in the area of deaf education and particularly language development of deaf children. His contribution to the workshop centered in his analyzing the need for individualized instruction.

The third speaker has a primary professional interest child development and early childhood education. This speaker treated language development from the developmental theories of Piaget and Bruner.

The fourth guest speaker for the workshop was a specialist in reading who treated reading as a set of acquired skills.

The materials used during the workshop were selected carefully in order that the specific objectives related to performance change in the participants would be facilitated. In a sense, the selection of materials for the workshop was made in order to model effective instructional planning. During the first week of the workshop, six films and two programmed texts were used.

Since the purpose of the first week of the workshop was to accomplish an introduction to principles of behavior, all of the activities of that week related to processes in the analysis of behavior. Born to Succeed and Behavior Theory in Practice were used as instructional materials to set the occasion

for group discussion and individual progress through the two programmed texts; Buckley and Walker and Homme, et al. In addition to the standard features of the programmed texts, the workshop leader scheduled individual interviews with each participant as they progressed through the instructional material.

During the second week of the workshop, the instructional material used included a film on child development, the Mager text, the McIntyre, et al modules, and videotape presentations of classroom behavior. The film on child development was used as an adjunct to the presentation of the third guest speaker. The Mager text was incorporated as an initial step in having the participants prepare curricular objectives for reading readiness. The automated instructional modules were used in the same manner. The videotapes of classroom activities and a field trip to a local school were used as stimulus events for training participants to observe and record specific aspects of childrens' behavior. The Lovaas film was shown as well, since it concentrates on shaping language behavior.

The workshop was designed to include sources of data on the objectives. The techniques for obtaining data during the workshop were included as part of the processes of the workshop itself. Principle sources of evaluative data were drawn from

the rate and accuracy with which the participants completed the programmed texts, their performance in verbal interviews with the workshop leader, the quality of objectives and criteria written by participants during the automated teaching session, in lesson plans for individualized instruction; written performance in the observation activities, and the number and quality of curriculum objectives written for reading readiness during the last three days of the workshop.

All participants completed the programmed texts assigned successfully. On the basis of their written responses to instructional frames and the exercises included as part of the texts, it was assumed that their verbal fluency with principles of behavior achieved the criterion levels specified by the texts. The additional devices incorporated in the workshop of face-to-face verbal interviews relating to sections of the instructional materials and the observation exercises indicated that each participant had at least a working knowledge of the processes and techniques involved in recording and observing behavior. It was also felt that verbal fluency was achieved regarding identification of behavior consequences as reinforcers or punishers; maintaining, increasing, and decreasing the occurrence of given behavioral events; establishing reinforcement procedures to meet specific objectives; and the

use of contingency contracting as a management procedure in the classroom.

The acquisition of these verbal capabilities on the part of the participants was a critical step in designing for change in curriculum development for the education of the deaf on a state-wide basis. Although only a restricted and clearly identifiable set of techniques was represented during the initial week of the workshop, it should be emphasized that they provided participants with a set of alternatives to existing practices. Completion by the participants of the automated instructional modules and their subsequent development of lesson plans insured a minimum level of behaviors involved in writing instructional objectives and in identifying performance criteria. This entry level skill was sequenced in such a way that it would lead directly into the acquisition of observing and tabulation of specific behaviors in classrooms.

The final set of objectives for participants was concerned with the production of sequenced objectives for children of pre-school age in several reading skill areas. The workshop environment was structured to facilitate the utilization of previously acquired skills by the participants through the means of small group writing tasks. The teams were to write and

sequence sets of behavioral objectives, performance criteria, and instructional tasks designed to facilitate a child's acquisition of pre-reading skills.

As the initial event in the long-term program, the workshop was intended to introduce notions of change in the education of the deaf in an effective and cooperative manner. It is critical that the future course of the program utilize the initial experience of the individuals involved in the workshop in order to build approaches to instruction which will result in improved learning by deaf children. During the workshop the program staff was able to bring together responsible individuals from throughout the state to build a sense of purpose and direction for the continued use of instructional technology and the utilization of new approaches to curriculum development. The workshop was followed by other programmed events designed to sustain the level of performance achieved during the workshop by the participants and to increase the effectiveness which is present in utilizing these tools with children directly.

SUMMARY

The growth of a technology of behavior in the laboratory has led to the development of an applied technology of behavior.

The rapid expansion of research efforts by operant technologists during the early and mid-sixties included the processes of instruction along with therapy and the home as sources for their experimental analyses of behavior. Because of the precise empirical data upon which functional relationships between behavior and the environment were based, early attempts to directly apply principles of behavior were very successful.

The relatively few psychologists engaged in the application of principles of behavior have been joined by growing numbers of professionals in other disciplines, particularly education. A few advanced textbooks on operant technology have been joined by a growing number of programmed texts and films in order that teachers and other members of helping professions can obtain skills in behavior modification procedures quickly and easily.

The rapid growth of behavior modification studies and applications has fostered certain individuals to concentrate applied techniques on certain sets of behavior principles. The growth is particularly exciting since at the base of every experimental investigation, model classroom, and recently trained teacher is the positive outcome of some child's improvement.

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